EMCI non-exhaustive testbench proposal

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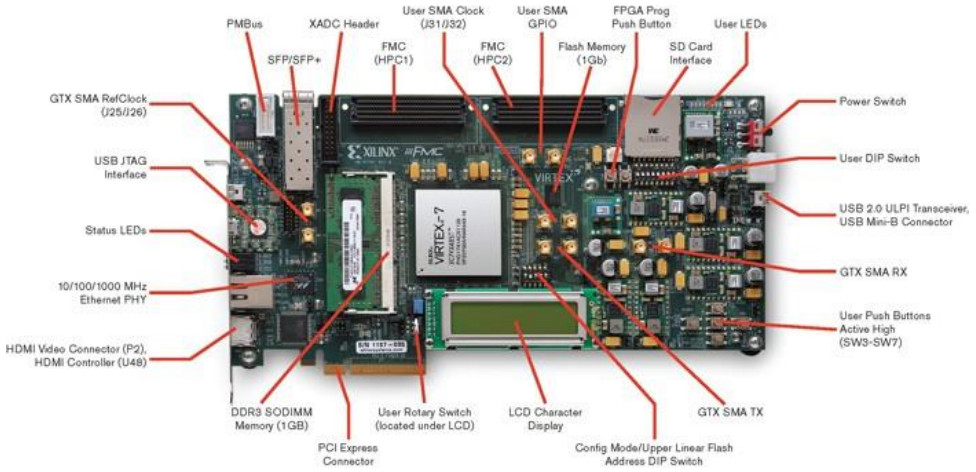
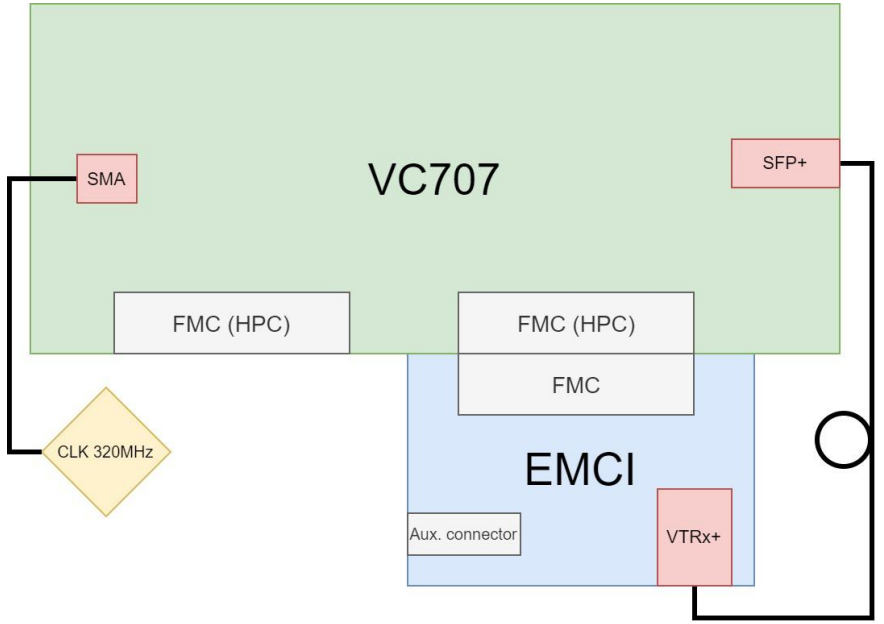
VC707: Virtex 7 Evaluation Board

- FMC HPC connector
  - Banks configurable @1.2V (VADJ)
- SFP+ connector
- SMA clock input
- Used in VLDB+ testbench



Testbench implementation

- Plugging EMCI FMC male connector directly into FMC connector of a VC707
  - VC707 may be configured to work @1.2V
  - 12V power coming from VC707 (FMC)
- High speed link is tested using VTRx+/SPF+
  - External 320MHz clock needed (SMA connectors)
  - eLinks need the CDR from the downlink stream to work
- Auxiliary connector tested by means of Raspberry Pi separately (provided with VLDB+)

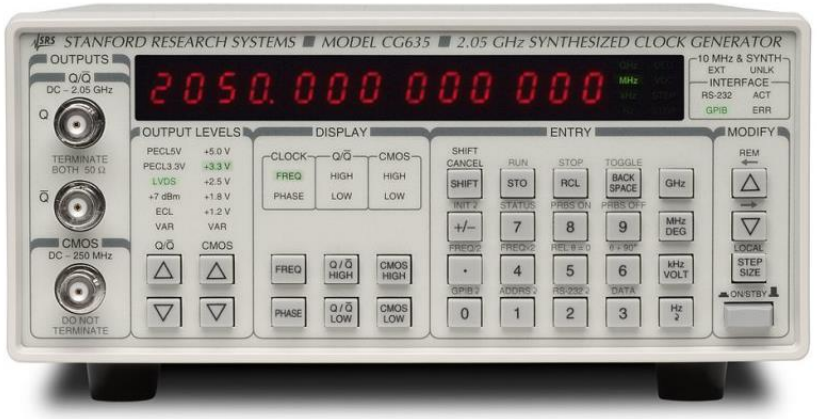


Tested features

- eLinks testing
  - Downlink: from 80 to 320 Mbps
  - Uplink: from 160 to 1280 Mbps
  - With normal IO pin (using SERDES)
    - VLDB+ has been tested up to 640 MHz
  - VC707 FMC transceivers cannot be used
    - Need external clock coming from FMC
- High speed testing
  - SPF+ transceiver
  - External clock generator needed [Proposal: CG635 (available in e-pool)]
- I2C master/slave, GPIO, PSClock, *ADC/DAC

Input eLinks (up-link)												
Up-link bandwidth [Gb/s]	5.12						10.24					
FEC coding	FEC5			FEC12			FEC5			FEC12		
Bandwidth [Mb/s]	160	320	640	160	320	640	320	640	1280	320	640	1280
Maximum number	28	14	7	24	12	6	28	14	7	24	12	6

Output eLinks (down-link)			
Bandwidth [Mb/s]	80	160	320
Maximum number	16	8	4



Problems

- Not all eLinks/features can be tested (even with optimal routing)
  - Max 58 pairs for testing (including eLinks TX/RX/CLK, GPIO, I2C…)
- ADC and DAC (1V range) cannot be properly tested
    - lpGBT ADC max input 1V, but 1.2V should be OK
    - lpGBT DAC can deliver 1V to VC707 (1.2 V high level)
  - For better testing, a different testbench with an FMC breakout board would be needed to plug to a function generator/oscilloscope
    - Cannot be tested at the same time as the rest of the features
- Final pinout depends on routing

	K		J		H		G		F		E		D		C		B		A	
	Standard	EMCI	Standard	EMCI	Standard	EMCI	Standard	EMCI	Standard	EMCI	Standard	EMCI	Standard	EMCI	Standard	EMCI	Standard	EMCI	Standard	EMCI
	HPC		HPC		LPC		LPC		HPC		HPC		LPC		LPC		HPC		HPC	
1	C	+2.5V Ref	GND	GND	VREF_A_M2C	+12V/2.5V Ref	GND	GND	PG_M2C		GND	GND	PG_C2M		GND	GND	RES1		GND	GND
2	GND	GND	P		L	GND	P		GND	GND	C	ELINK_IN_P16	GND	GND	P	ELINK_IN_P20	GND	GND	P	ELINK_CLK_P21
3	GND	GND	N		N	GND	N		GND	GND	C	ELINK_IN_N16	GND	GND	N	ELINK_IN_N20	GND	GND	N	ELINK_CLK_N21
4	P		GND	GND	CLK0_M2C_P		GND	GND	C	ELINK_CLK_P11	GND	GND	P		GND	GND	DP3_M2C_P	EXT_NTC_P1	GND	GND
5	N		GND	GND	CLK0_M2C_N		GND	GND	C	ELINK_CLK_N11	GND	GND	N		GND	GND	DP3_M2C_N	EXT_NTC_P2	GND	GND
6	GND	GND	HA03_P	ELINK_OUT_P5	GND	GND	LA00_P_CC	ELINK_IN_P4	GND	GND	HA05_P	ELINK_IN_P17	GND	GND	P	ELINK_CLK_P20	GND	GND	P	ELINK_CLK_P22
7	HA02_P	ADC2	HA03_N	ELINK_OUT_N5	LA02_P	GPIO0	LA00_N_CC	ELINK_IN_N4	HA04_P	ELINK_IN_P12	HA05_N	ELINK_IN_N17	GND	GND	N	ELINK_CLK_N20	GND	GND	N	ELINK_CLK_N22
8	HA02_N	ADC3	GND	GND	LA02_N	GPIO1	GND	GND	HA04_N	ELINK_IN_N12	GND	GND	LA01_P_CC	I2C_SLAVE_SCL_0	GND	GND	DP3_M2C_P	EXT_NTC_N	GND	GND
9	GND	GND	HA07_P	ELINK_OUT_P9	GND	GND	LA03_P	ELINK_IN_P5	GND	GND	HA09_P	ELINK_IN_P18	LA01_N_CC	I2C_SLAVE_SDA_0	GND	GND	DP3_M2C_N		GND	GND
10	HA06_P	ELINK_CLK_P	HA07_N	ELINK_OUT_N9	LA04_P	GPIO2	LA03_N	ELINK_IN_N5	HA08_P	ELINK_IN_P13	HA09_N	ELINK_IN_N18	GND	GND	LA06_P	ADC4	GND	GND	P	ELINK_CLK_P23
11	HA06_N	ELINK_CLK_N	GND	GND	LA04_N	GPIO3	GND	GND	HA08_N	ELINK_IN_N13	GND	GND	LA05_P	ELINK_OUT_P0	LA06_N	ADC5	GND	GND	N	ELINK_CLK_N23
12	GND	GND	HA11_P	ELINK_OUT_P10	GND	GND	LA08_P	ELINK_IN_P6	GND	GND	HA10_P	ELINK_IN_P19	LA05_N	ELINK_OUT_N0	GND	GND	DP7_M2C_P		GND	GND
13	HA10_P	PSCLK_P0	HA11_N	ELINK_OUT_N10	LA07_P	GPIO4	LA08_N	ELINK_IN_N6	HA12_P	ELINK_IN_P14	HA13_N	ELINK_IN_N19	GND	GND	LA09_P	ELINK_OUT_P1	GND	GND	GND	GND
14	HA10_N	PSCLK_N0	GND	GND	LA07_N	GPIO5	GND	GND	HA12_N	ELINK_IN_N14	GND	GND	LA09_P	ELINK_OUT_P1	LA10_P	ADC6	GND	GND	P	ELINK_CLK_P24
15	GND	GND	HA14_P	ELINK_OUT_P11	GND	GND	LA12_P	ELINK_IN_P7	GND	GND	HA16_P	ELINK_CLK_P16	LA09_N	ELINK_OUT_N1	LA10_N	ADC7	GND	GND	N	ELINK_CLK_N24
16	HA17_P_CC	PSCLK_P1	HA14_N	ELINK_OUT_N11	LA11_P	GPIO6	LA12_N	ELINK_IN_N7	HA15_P	ELINK_IN_P15	HA16_N	ELINK_CLK_N16	GND	GND	GND	GND	DP8_M2C_P	ELINK_CLK_P25	GND	GND
17	HA17_N_CC	PSCLK_N1	GND	GND	LA11_N	GPIO7	GND	GND	HA15_N	ELINK_IN_N15	GND	GND	LA13_P	ELINK_IN_P0	GND	GND	DP8_M2C_N	ELINK_CLK_N25	GND	GND
18	GND	GND	HA18_P	ELINK_IN_P8	GND	GND	LA16_P	ELINK_CLK_P4	GND	GND	HA20_P	ELINK_CLK_P17	LA13_N	ELINK_IN_N0	LA14_P	I2C_MASTER_SCL_0	GND	GND	P	ELINK_CLK_P26
19	HA21_P	PSCLK_P2	HA18_N	ELINK_IN_N8	LA16_P	ELINK_IN_P2	LA16_N	ELINK_CLK_N4	HA18_P	ELINK_CLK_P12	HA20_N	ELINK_CLK_N17	GND	GND	LA14_N	I2C_MASTER_SDA_0	GND	GND	N	ELINK_CLK_N26
20	HA21_N	PSCLK_N2	GND	GND	LA16_N	ELINK_IN_N2	GND	GND	HA18_N	ELINK_CLK_N12	GND	GND	LA17_P_CC	ELINK_IN_P1	GND	GND	P		GND	GND
21	GND	GND	HA22_P	ELINK_IN_P9	GND	GND	LA20_P	ELINK_CLK_P8	GND	GND	HB03_P	ELINK_CLK_P18	LA17_N_CC	ELINK_IN_N1	GND	GND	N		GND	GND
22	HA23_P	PSCLK_P3	HA22_N	ELINK_IN_N9	LA19_P	ELINK_IN_P3	LA20_N	ELINK_CLK_N8	HB02_P	ELINK_CLK_P13	HB03_N	ELINK_CLK_N18	GND	GND	LA18_P_CC	I2C_MASTER_SCL_1	GND	GND	P	ELINK_IN_P21
23	HA23_N	PSCLK_N3	GND	GND	LA19_N	ELINK_IN_N3	GND	GND	HB02_N	ELINK_CLK_N13	GND	GND	LA23_P	ELINK_CLK_P0	LA18_N_CC	I2C_MASTER_SDA_1	GND	GND	N	ELINK_IN_N21
24	GND	GND	HB01_P	ELINK_IN_P10	GND	GND	LA22_P	ELINK_CLK_P5	GND	GND	HB05_P	ELINK_CLK_P19	LA23_N	ELINK_CLK_N0	GND	GND	DP5_C2M_P		GND	GND
25	HB00_P_CC	GPIO8	HB01_N	ELINK_IN_N10	LA21_P	ELINK_CLK_P3	LA22_N	ELINK_CLK_N5	HB04_P	ELINK_CLK_P14	HB05_N	ELINK_CLK_N19	GND	GND	GND	GND	DP5_C2M_N		GND	GND
26	HB00_N_CC	GPIO9	GND	GND	LA21_N	ELINK_CLK_N3	GND	GND	HB04_N	ELINK_CLK_N14	GND	GND	LA26_P	ELINK_CLK_P1	LA27_P	DAC	GND	GND	P	ELINK_IN_P22
27	GND	GND	HB07_P	ELINK_IN_P11	GND	GND	LA25_P	ELINK_CLK_P7	GND	GND	HB09_P	ELINK_OUT_P12	LA26_N	ELINK_CLK_N1	LA27_N	SC_I2C	GND	GND	N	ELINK_IN_N22
28	HB06_P_CC	GPIO10	HB07_N	ELINK_IN_N11	LA24_P	ELINK_CLK_P3	LA25_N	ELINK_CLK_N7	HB09_P	ELINK_CLK_P15	HB09_N	ELINK_OUT_N12	GND	GND	GND	GND	DP9_C2M_P		GND	GND
29	HB06_N_CC	GPIO11	GND	GND	LA24_N	ELINK_CLK_N3	GND	GND	HB08_P	ELINK_CLK_N15	GND	GND	YCK		GND	GND	DP9_C2M_N		GND	GND
30	GND	GND	HB11_P	ELINK_CLK_P8	GND	GND	LA23_P	ELINK_OUT_P8	GND	GND	HB10_P	ELINK_OUT_P13	TCK		SCL		GND	GND	P	ELINK_IN_P23
31	HB10_P	GPIO12	HB11_N	ELINK_CLK_N8	LA28_P	ELINK_OUT_P2	LA29_N	ELINK_OUT_N8	HB12_P	SLOW_ELINK_IN_P	HB13_N	ELINK_OUT_N13	TDO		SDA		GND	GND	N	ELINK_IN_N23
32	HB10_N	GPIO13	GND	GND	LA29_N	ELINK_OUT_N2	GND	GND	HB12_N	SLOW_ELINK_IN_P	GND	GND	3P3VAUX		GND	GND	DP7_C2M_P		GND	GND
33	GND	GND	HB15_P	ELINK_CLK_P9	GND	GND	LA31_P	ELINK_OUT_P9	GND	GND	HB19_P	ELINK_OUT_P14	TMS		GND	GND	DP7_C2M_N		GND	GND
34	HB14_P	ELINK_IN_P22	HB15_N	ELINK_CLK_N9	LA30_P	ELINK_OUT_P3	LA31_N	ELINK_OUT_N9	HB16_P	SLOW_ELINK_OUT_P	HB19_N	ELINK_OUT_N14	TRST_L		GA0		GND	GND	P	ELINK_IN_P24
35	HB14_N	ELINK_IN_N22	GND	GND	LA30_N	ELINK_OUT_N3	GND	GND	HB16_N	SLOW_ELINK_OUT_P	GND	GND	GA1		12P0V	+12V Input	GND	GND	N	ELINK_IN_N24
36	GND	GND	HB18_P	ELINK_CLK_P10	GND	GND	LA33_P	ELINK_OUT_P7	GND	GND	HB21_P	ELINK_OUT_P15	3P3V		GND	GND	DP9_C2M_P	ELINK_IN_P25	GND	GND
37	HB17_P_CC	RSTOUTB	HB18_N	ELINK_CLK_N10	LA32_P	ELINK_OUT_P4	LA33_N	ELINK_OUT_N7	HB20_P	SLOW_ELINK_CLK_P	HB21_N	ELINK_OUT_N15	GND	GND	12P0V	+12V Input	DP9_C2M_N	ELINK_IN_N25	GND	GND
38	HB17_N_CC	STATEOVRD	GND	GND	LA32_N	ELINK_OUT_N4	GND	GND	HB20_N	SLOW_ELINK_CLK_P	GND	GND	3P3V		GND	GND	GND	GND	P	ELINK_IN_P26
39	GND	GND	VIO_B_M2C		SCL	GND	VADJ		GND	GND	VADJ		GND	GND	3P3V		GND	GND	N	ELINK_IN_N26
40	VIO_B_M2C		GND	GND	VADJ		GND	GND	VADJ		GND	GND	3P3V		GND	GND	RES0		GND	GND